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The Association Between Defined Benefit Pension Plan Funded Status and Bond Ratings*
(Pension Plan Funded Status and Bond Ratings)

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THE ASSOCIATION BETWEEN DEFINED BENEFIT PENSION PLAN
FUNDED STATUS AND BOND RATINGS

The objective of this study is to determine if defined benefit pension plan funded status is associated with bond ratings. The linkage between pension plan funded status and bond ratings is the hypothesis that unfunded pension benefits are equivalent to additional debt of the firm. Pension variables are added to a control model which explains bond ratings of new issue public utility bonds between 1981 and 1984. A statistically significant increase in explanatory power is observed when pension funded status is measured using estimated economic and termination pension liabilities.

THE ASSOCIATION BETWEEN BENEFIT PENSION PLAN FUNDED STATUS AND BOND RATINGS

The objective of this study is to determine if defined benefit pension plan funded status is associated with bond ratings. Defined benefit pension plans are plans where the employer has agreed to pay certain pension benefits to employees upon retirement. Under the Employee Retirement Income Security Act (ERISA), firms are required to make at least minimal annual contributions to a pension fund but the funded status of pension plans varies considerably. Bond ratings are a measure of bond default risk. The basic premise of the study is that if pension funding data are associated with default risk, the addition of pension information to prediction models should result in better prediction of bond ratings. The linkage between pension information and bond ratings is the hypothesis that unfunded pension benefits are equivalent to additional debt of the firm.

A model explaining the bond ratings of utility offerings is developed. Variables measuring pension funded status are added to the model and the differential explanatory effect is tested to determine if the pension variables are associated with an increase in explanatory power. The coefficients of the pension variables are analyzed in order to help explain the nature of the association between pension information and the bond ratings.

The Financial Accounting Standards Board (FASB) has recently resolved issues relating to the measurement of the employer's defined benefit pension plan obligation and to recognition of a net pension liability. The recent FASB pronouncement on pension reporting, Statement of Financial Accounting Standards

(SFAS) No. 87, will require many firms to recognize a net pension liability on the balance sheet. Pension disclosures of plan assets and total accumulated benefit obligations currently appear only in footnotes to the financial statements.

There has been considerable opposition to the FASB decision to book net pension liabilities on the grounds that recognition will have undesirable economic consequences. The elevation of pension disclosures from footnotes to the balance sheet should not constitute new information given semi-strong market efficiency. The FASB takes the position that despite the findings of efficient market research, footnote disclosure is not an adequate substitute for recognition (FASB, 1982). The demonstration of an association between pension information and bond ratings would support the FASB's deductive conclusion that unfunded pension benefits represent a liability.

In addition to controversy over recognition of net pension liabilities, there is disagreement about how these liabilities should be measured. Currently, under SFAS No. 36, pension liabilities reported in footnote disclosures are measured using a termination benefit perspective since they reflect the present value of pension benefits earned to date. The effect of expected future salary growth is not taken into account. If firms expect to maintain pension plans and to adjust benefit levels for changing prices, the resulting "economic" pension liabilities would be much higher and firms would appear to be less well funded. Footnote disclosures under SFAS No. 87 will present "economic" pension liabilities, which take future salary growth into account.

SFAS No. 87 disclosures will also report a measure of "termination" liabilities which do not take future salary growth into account and which form the basis for possible recognition of a net pension liability. The principal difference between pension liabilities under SFAS No. 36 and "termination" liabilities under SFAS No. 87 is the use of a uniform actuarial rate to determine the present value of pension liabilities. Although pension liabilities reported under SFAS No. 36 are figured using a uniform actuarial method, firms use a wide range of actuarial rates to calculate the present value of benefits. SFAS No. 87 (1985) mandates use of actuarial rates which reflect termination annuity rates or rates of return on high quality fixed income investments. In this study, pension funded status will be measured using estimated termination and economic pension liability measures as well as reported measures under SFAS No. 36 in order to determine which measure is most closely associated with bond ratings.

This study is concerned with the association of accounting disclosures with a measure of bond default risk. Predictive ability as a general framework for evaluating alternative accounting measures is proposed by Beaver, Kennelly and Voss (1968). Alternative accounting measures can be evaluated in terms of their ability to predict events of interest to decision makers. The demonstration of an association between pension information and bond ratings would indicate that pension information is currently capable of being used by creditors. In addition, insights into the form of the relationship may add support to the FASB's deductive conclusion that unfunded pension benefits represent a liability. Finally, associations between pension variables measured under different assumptions about the nature of the pension liability may indicate which liability measure is most closely associated with default risk.[1]

EVIDENCE OF THE DEBT EQUIVALENCE OF UNFUNDED PENSION BENEFITS

A theoretical linkage between pension information and bond ratings is necessary in order to predict the effect of pension information on bond risk premiums. Financial analysts (Treynor, Regan and Priest, 1976) assert that after the passage of the Employee Retirement Income Security Act (ERISA) in 1974, pension liabilities and pension assets became liabilities and assets of the firm. Treatment of net pension liabilities and assets as equivalent to other firm liabilities and assets is justified by legal relationships and plan termination outcomes. The firm has an obligation to the Pension Benefit Guarantee Corporation (PBGC) for up to 30% of firm net worth in case pension assets do not cover guaranteed benefits. The firm's obligation to the PBGC has the status of a tax lien and is therefore senior to most other debt. Ippolito (1985a) indicates that in virtually all cases of pension plan termination to date, any excess plan assets have reverted to the firm. Therefore, in case of plan termination, there may be either a legal net liability or a reversion of net assets. Standard & Poor's (1982) and Moody's (1978) bond rating agencies recommend calculation of pension-adjusted ratios which treat unfunded pension liabilities as additional debt.

Empirical evidence on the effect of unfunded pension benefits on the value of the firm is available from a series of cross-sectional equity valuation studies. Oldfield (1977), Feldstein and Seligman (1981) and Feldstein and Morck (1982) all find valuation effects consistent with the debt equivalence of unfunded pension liabilities. Daley's (1984) equity valuation study concludes that pension expense is more consistent than measures of unfunded pension liabilities with the value of the firm. This conclusion is not necessarily inconsistent with debt equivalence since the effect of debt on bond risk is due to the future cash flow commitments represented by the debt. Daley indicates that the future cash flow commitments are more clearly represented by current pension cash flow than by unfunded benefit measures. Landsman (1986) finds that both pension assets and liabilities appear to be valued by the equity securities market as corporate assets and liabilities.

Stone (1981), Martin and Henderson (1983) and Dhaliwal (1986) investigate the association of unfunded pension benefits with market risk measures. Stone finds evidence of weak associations between pension information and systematic and nonsystematic risk measures. Dhaliwal finds that the explanatory power of a model explaining systematic risk is improved by the inclusion of unfunded pension liability information. Martin and Henderson find that unfunded pension benefit information and subordinate status possess similar information content in the prediction of bond ratings.[2] Livnat (1984) concludes that changes in unfunded pension liabilities provide incremental information content beyond information contained in earnings realizations.

This study is similar to Stone (1981), Martin and Henderson (1983) and Dhaliwal (1986) in that a connection is hypothesized between net pension liabilities and default risk. The way in which net pension liabilities impact bond ratings is through impact on the bondholder's assessment of default risk. Larger net pension liabilities indicate higher future annual or terminal payments, similar to obligations from other forms of debt, which increase risk of default.

DEVELOPMENT OF A BOND RATING PREDICTION MODEL

The dependent variable of the bond rating model is Standard & Poor's bond rating for each issue. Ratings AAA, AA, A and BBB represent declining investment grade bond ratings. BB through C are speculative issues. Standard &

Poor's rating definitions are contained in Appendix A. In addition to the traditional categories of bond ratings, AAA through C, Standard & Poor's use plus or minus to indicate the relative position of the bond in its rating category. The rating categories are coded in an interval scale. AAA is 19, AA+ is 18 and so on. The lowest bond rating for this sample is B+ or 6.

Kaplan and Urwitz (1979) provide a comprehensive critique of bond rating prediction studies. Previous studies use a relatively small set of variables which include subordinate status, size, earnings stability, leverage, interest coverage and profitability. Models using a relatively small set of financial ratios and issue characteristics have typically achieved about two-thirds accuracy in predicting ratings on similar holdout samples.

insert Table 1 here

The bond rating model, described in Table 1, includes variables to control for issue characteristics such as presence of sinking fund and first mortgage status. Several variables are included to control for political and regulatory risk factors particularly associated with utilities which would not be reflected in financial ratios. A recent problem for electric utilities is rate shock where the magnitude and extent of necessary jumps in electric utility rates to reflect new plants coming on line may exceed politically acceptable levels. A dummy variable NUKE1 is included for electric utilities with involvement in nuclear generating facility operation or construction since considerable uncertainty attaches to such involvements. A dummy variable NUKE2 is included for utilities which are experiencing problems connected with their nuclear generating facilities at the time of the bond issue. Rising construction costs and fuel prices and spiralling costs of new capital create significant financial pressures for utilities. State regulatory bodies differ considerably in how rate regulation is handled and local political climates differ in terms of likelihood of allowing significant rate increases. A dummy variable REG1 is coded one when CreditWeek indicates that regulatory cooperation is necessary for maintenance of existing financial well-being of the utility. REG2 is coded one when CreditWeek indicates that regulatory cooperation is critical to the continuation of the utility.[3]

Sources for the development of the financial variables include Standard & Poor's Rating Guide (1979), Melicher's (1974) factor analysis of utility ratios and Altman and Katz's (1976) bond rating prediction study using a utility sample. The financial variables chosen for use in this study cover the categories of factors found to be important in previous studies: cash flow adequacy, asset protection, capitalization, size and earning stability. The variables representing cash flow adequacy, asset protection and capitalization are cash flow to construction expenditures (CONST), the property funding ratio (long term debt to property, plant and equipment) (PROP), and the debt-equity ratio (DE). Size (measured as permanent capitalization -- stockholder's equity plus long term debt) (SIZE) and coefficient of variation of return on equity for five years (ROE) represent the size and earnings stability factors found important by Melicher (1974). Pretax interest coverage (COV) is one of the most important financial ratios used by bond raters (Standard & Poor's, 1979).

Different levels of these ratios would be the norm in the three different industry groups in the sample (electric, natural gas and telephone). Industry medians are calculated using the utilities in Standard & Poor's 40 utilities index. The financial variables included in the control model (designated by R____) are all adjusted for industry effects and represent the position of the firm relative to the industry group median for each financial variable.[4]

The pension variables added to the risk premium model are measures of the funded status of the defined benefit pension plans of the firm. A firm with a low measure of funded status has less well funded pension obligations and therefore has larger obligations for future annual and/or terminal payments. Funded status measures are expected to be directly related to bond ratings - well funded plans should be associated with high bond ratings and vice versa.

The funded status of the firm's pension plans is measured by three variables. The funding ratio RFR (plan assets to accumulated benefits) indicates the relative funded status of the pension plans. Two additional measures relate to the magnitude of the net pension asset or liability. The net pension asset or liability relative to the size of the firm is RSUNB ((plan assets minus accumulated benefits) over capitalization). RPUNB relates the net pension asset or liability to the yearly funding cash flow ((plan assets minus accumulated benefits) over pension expense). Since plan assets are measured using market value, different levels of pension ratios can be expected for different industry subgroups and for different years. The pension variables used are adjusted for industry and year effects. Details of the calculation of all variables are presented in Table 2.

insert Table 2 here

The principal hypothesis of the study, stated in null form, is:

H_0: The addition of the pension variables to the control model does not increase the explanatory power of the model.

H_1: The addition of the pension variables to the control model does increase the explanatory power of the model.

The pension assets and liabilities reported in footnote disclosure under SFAS No. 36 are used in this study. Pension variables based on this reported information are called "reported" pension variables. A termination benefit perspective is used under SFAS No. 36 and the pension liabilities are reported as if benefits are frozen at current levels (i.e. based on benefits earned to date by employees). Discount rates used in figuring these liabilities vary widely between firms. In order to measure pension liabilities as will be done under SFAS No. 87, a uniform market-determined discount rate should be used. An estimate of the termination liability is made by applying the Winklevoss (1977) adjustment method to standardize pension liabilities using Moody's Aaa Corporate Bond Yield Average as the high quality fixed income interest rate.[5] Pension liabilities adjusted in this manner are called "termination" liabilities.

If firms expect to continue pension plans (which should be the case for public utilities) and future salary growth is taken into account, the resulting economic liability is much larger than the reported liability (Ippolito, 1986a). Economic benefits reflect real dollar promises to workers based on an implicit contract to continue pension plans and adjust benefits for changing prices. Recent studies by Pesando (1985) and Ippolito (1985b; 1986a) support the implicit contracting view of pension promises. "Economic" liabilities are estimated using the Ippolito method.[6] The results of bond rating models are compared using pension funded status variables measured under these three measures of pension liabilities: reported, termination and economic. Although the conversion procedures used to get termination and economic liabilities are necessarily somewhat ad hoc, it is completely possible that bond raters make similar ad hoc adjustments of reported pension liabilities.

insert Table 3 here

Descriptive statistics on all the variables are presented in Table 3. To illustrate the difference between the three pension liability measures, the mean funding ratios (plan assets to pension liabilities) using reported, economic and termination liability measures are, respectively, 1.2, .80 and 4.2. This indicates that from a termination perspective, the plans are overfunded whereas from an economic or long-term perspective they are underfunded. In a cross-sectional regression the relative rather than absolute value of the pension ratios are important; these rankings may be different when reported, economic and termination benefits are used. Adjustments are made to the pension variables to remove industry and year effects. Correlations between pension liabilities using the three measurements are high but correlation between the variables representing pension funded status is lower. Correlations between the pension variables are presented in Table 4.

SAMPLE

The sample used is public utility new bond issues from the early part of 1981 through 1984. Sample dates are chosen to coordinate with availability of Statement of Financial Accounting Standards (SFAS) No. 36 pension disclosures. New issues are chosen so that bond ratings are current. Evidence on market reaction to bond rating changes (for instance, Weinstein, 1977 and Pinches and Singleton, 1978) indicates that there may be a considerable (15 - 18 month) lag between market reactions to unfavorable events and bond rating changes. Public utilities are chosen partly to obtain an adequate sample size as there are many more public utility issues during this time period than other corporate issues.[7] The use of a public utility sample may also mitigate problems in detecting the effects of unfunded pension benefits on default risk measures.

Lys (1984) finds that the debt-equity ratio has little power to explain debt default risk unless variables to control for total firm risk are included in the model. The use of a relatively homogeneous group such as public utilities controls for operating risk. In addition, capital structure research indicates that there are different typical debt levels for firms across industry groups (DeAngelo and Masulis, 1980; Bowen, Daley and Huber, 1982). The impact of additional debt may be easier to detect if the sample is limited to a single industry group.

Issues between February 23, 1981 and February 29, 1984 are included in the sample if the issuers are considered to be public utilities by Moody's Public Utility Manual and a full set of pension and financial information is available. Lack of publicly available pension information causes 36 observations to be dropped. Because they are not comparable with other issues, one convertible issue, one deep discount issue and four very small issues offered on a "best efforts basis" are not included in the sample. The final sample consists of 282 issues.

ESTIMATION

Early bond rating prediction studies use ordinary least squares (OLS) estimation. Kaplan and Urwitz (1979) criticize the use of OLS estimation in bond rating studies on the grounds that it involves an unwarranted interval assumption. For example, OLS implies that the interval between AAA and AA is the same as the interval between BBB and BB. There is no reason to believe this would be true. Kaplan and Urwitz favor the use of probit estimation. Kaplan and Urwitz test probit versus OLS estimation with their bond rating prediction model. Despite theoretical superiority of probit, little difference is found. They suggest that with six rating categories, the dependent variable approximates a continuous variable and that examination of the cutoff points indicates that the ratings categories conform surprisingly well to an interval assumption. The model in this study is not found to be sensitive to estimation by OLS versus probit (Reiter and Emery, 1986); with fourteen levels for the dependent variable there is even less of an interval problem than noted by Kaplan and Urwitz. OLS estimation results are presented in Table 5.

Predictive ability studies have not always been clear about how the results of using alternate accounting disclosures should be compared. In several studies (for instance, Baran et al., 1980), the authors simply present the percentages of correct classification from the various models with no statistical test of the differences. Other studies (for example Elam, 1975 and Martin and Henderson, 1983) use chi-square tests to evaluate the improvement in classification accuracy. Only very striking improvement in predictive accuracy would be significant using this approach. It is not clear that it would be reasonable to expect such large effects from the use of alternate accounting disclosures. In this study, a general linear test is used to evaluate the statistical significance of the improvement in explanatory power of the model from addition of the pension variables. The formula is:

$$F^* = \frac{SSE\ (R) - SSE\ (F)}{d.f.R - d.f.F} \bigg/ \frac{SSE\ (F)}{d.f.F}$$

Where SSE (R) and SSE (F) and d.f.R and d.f.F are the sum of squared errors and degrees of freedom for the reduced and full models respectively. F* is distributed by the F distribution with (d.f.F - d.f.R), d.f.F degrees of freedom (Neter and Wasserman, 1974).

The control model (without the pension variables) results conform well to prior expectations. The adjusted R-square is .66 which means that the model accounts for about two-thirds of the variation in bond rating. Each variable has the expected sign and ten of the twelve variables have significant coefficients at the .01 level. One potential problem with tests of incremental information content is that if the control model variables are highly correlated with the pension variables, the test does not make much sense. Collinearity diagnostics suggested by Belsley, Kuh and Welsch (1980) do not indicate any strong collinear relations between control and pension variables. In addition, regressions are run with the pension variables as dependent variables and the financial control variables as independent variables. Results of the regressions are reported in Table 4; none of the adjusted R-squares are greater than .20. Collinear relations between the pension and financial variables are not a problem in this sample however strong collinearity between the pension variables makes interpretation of the individual coefficients difficult as discussed in the following section.

insert Table 4 here

RESULTS

insert Table 5 here

Results of the regressions are reported in Table 5. When the pension variables based on reported pension liability are added to the control model, the F statistic for the general linear test is not significant and none of the coefficients of the pension variables are significant. When pension variables based on economic and termination liabilities are added to the control model, the resulting F statistics for the general linear test are significant at the .05 level. The three pension variables represent the funded status of the firm's pension plans and are expected to be directly related to bond ratings. Several sign anomalies are present in the results in that REUNB and RPTUNB are inversely related to bond ratings. Collinearity diagnostics (Belsley, Kuh and Welsch, 1980) and simple correlations reported in Table 4 indicate that there are strong collinear relations between the pension variables which make interpretation of individual coefficients difficult. The unexpected sign of

REUNB appears to be due to a few observations with well funded plans and poor bond ratings. This may be due to the fact that several of the utilities in the sample had dramatic falls in bond ratings over a relatively short period of time due to problems with nuclear generating facilities. When the pension variables are added to the model one at a time rather than three at a time, more variables have significant positive coefficients than significant negative coefficients so that a direct relation between funded status and bond ratings is supported.

CONCLUSIONS

The significant improvement in explanatory power of the model when pension variables based on economic and termination pension liabilities are added to the model provides support for previous research conclusions that unfunded pension liabilities are debt equivalents. The results also support the FASB decision to require balance sheet recognition of unfunded pension liabilities under certain circumstances. Differences in results using pension variables based on reported, economic and termination pension liability measures support the FASB's decision to require use of a uniform, market determined actuarial rate. When reported pension variables, based on pension liabilities figured using a common actuarial method but diverse actuarial rates, are used there is not significant association with bond ratings. But when economic and termination pension variables are used, a significant association is found. One implication is that the bond market may employ some implicit process of standardization of actuarial rates.

One obvious limitation of the study is that the sample is limited to utility bonds. There is always the possibility that relationships between pension information and bond risk premiums are in some way different for utilities than for other firms. Another possible limitation is related to the time period used in this study. Interest rates were at very high levels during this period and a certain amount of self-selection into the sample may have taken place. Subject to these limitations, the results are consistent with the contention that information on the funded status of defined benefit pension plans has incremental importance in the explanation of bond ratings.

1. Supposing that an association is found, predictive ability research cannot infer that a particular accounting alternative of disclosure is better or more desirable (Gonedes and Dopuch, 1974). Lev and Olson (1982) point out, however, that contemporaneous associations between accounting information and market measures may infer a correlation between information and future payoffs which is of intrinsic interest.

2. One difference between this study and Martin and Henderson (1983) is that this study evaluates the increase in explanatory power from adding pension ratios to a control model whereas Martin and Henderson evaluate the difference in predictive accuracy between rating prediction models using traditional and pension-adjusted financial ratios. Also, pension data in this study come from footnote disclosures prepared under SFAS No. 36 whereas Martin and Henderson use pre-SFAS No. 36 data.

3. An association between regulatory climate and bond ratings has been demonstrated (Pinches, Singleton and Jahankhani, 1978). Various agencies, for example Value Line, provide ratings of regulatory climate by state. Use of these rankings would provide a more objective measure of regulatory climate but because of the speed with which circumstances surrounding the construction of nuclear facilities change within the time period of this study, the more timely CreditWeek information is used.

4. Significant differences are found between the means of at least two of the three industry groups for all the financial control variables.

5. Using the Winklevoss (1977) adjustment process, pension liabilities are altered by 4% for each 1/4% change in actuarial rate. For example, a 1% increase in interest rate (from the rate used in reported disclosures to the new borrowing rate) would lower pension liability by $(1 - (1.04)^{-4})$ or 14.52%.

6. Calculation of economic benefits follows the procedures developed by Ippolito (1986a, 1986b). The ratio of economic to reported liabilities is e to the (-.057) times (economic rate - reported rate) for retirees and e to the (-.077) times (economic rate - reported rate) for active participants. Economic rates are 1% for actives and 1.5% plus 50% of inflation for retirees. Average sample yield for each year is used as the measure of long-term nominal interest rates. The economic rates used for retirees are 8.996, 8.007 and 7.102 for years one through three respectively. It is also assumed that the ratio of active to total participants is 85%. This procedure is similar to assuming an overall actuarial rate of 2% (Ippolito, 1986a). The exponents of -.057 and -.077 are derived by Ippolito from regressions using individual plan data from 1978. To the extent that these relations do not hold for 1981 through 1984 or for electric utilities, the economic liability measure will contain measurement error.

7. The fact that utilities are regulated industries does not invalidate their use in this study. Public utility regulation does not guarantee returns to bondholders or payment of employee pensions. Rate-making is often not particularly timely, a phenomena known as regulatory lag, and in times of inflation and rising fuel prices utilities suffer from problems of attrition (replacement costs of plant and equipment exceed historical costs) and erosion

(actual operating expenses exceed those embedded in the rates). In many ways, utilities face an environment not very different from that of competitive firms (Howe and Rasmussen, 1982).

APPENDIX A

STANDARD & POOR'S RATING DEFINITIONS

(Source: Standard & Poor's CreditWeek, October 18, 1982)

AAA Debt rated 'AAA' has the highest rating assigned by Standard & Poor's. Capacity to pay interest and repay principal is extremely strong.

AA Debt rated 'AA' has a very strong capacity to pay interest and repay principal and differs from the highest rated issues only in small degree.

A Debt rated 'A' has a strong capacity to pay interest and repay principal although it is somewhat more susceptible to the adverse effects of changes in circumstances and economic conditions than debt in higher rated categories.

BBB Debt rated 'BBB' is regarded as having an adequate capacity to pay interest and repay principal. Whereas it normally exhibits adequate protection parameters, adverse economic conditions or changing circumstances are more likely to lead to a weakened capacity to pay interest and repay principal for debt in this category than in higher rated categories.

BB, B, CCC, CC Debt rated 'BB', 'B', 'CCC', or 'CC' is regarded, on balance, as predominantly speculative with respect to capacity to pay interest and repay principal in accordance with the terms of the obligation. 'BB' indicates the lowest degree of speculation and 'CC' the highest degree of speculation. While such debt will likely have some quality and protective characteristics, these are outweighed by large uncertainties or major risk exposures to adverse conditions.

PLUS (+) or MINUS (-): The ratings from 'AA' to 'B' may be modified by the addition of a plus or minus sign to show relative standing within the major rating categories.

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Table 1

Bond Rating Model

Variable	Expected Sign	Description
		Dependent Variable
SR		Standard & Poor's Bond Rating
		Issue Characteristics
SF	-	Sinking fund
MTGE	+	First mortgage
		Political and Regulatory Factors
NUKE1	-	Involvement with nuclear plant
NUKE2	-	Trouble with nuclear Plant
REG1	-	Regulatory cooperation necessary
REG2	-	Regulatory cooperation vital
		Financial Variables (All industry adjusted)
RCONST	+	Cash flow to construction expenditure
RPROP	-	Property funding ratio
RDE	-	Debt-equity ratio
RSIZE	+	Permanent capitalization
RROE	-	Coefficient of variation of return on equity
RCOV	+	Pretax interest coverage
		Pension Variables (Industry adjusted)
RFR	+	Pension plan assets to reported benefits
RSUNB	+	(Pension plan assets - reported benefits) to size
RPUNB	+	(Pension plan assets - reported benefits) to pension expense
		-or-
REFR	+	Pension plan assets to economic benefits
REUNB	+	(Pension plan assets - economic benefits) to size
RPEUNB	+	(Pension plan assets - economic benefits) to pension expense
		-or-
RTFR	+	Pension plan assets to termination benefits
RTUNB	+	(Pension plan assets - termination benefits) to size
RPTUNB	+	(Pension plan assets - termination benefits) to pension expense

Table 2

Variable Definitions

Variable	Dimension	Composition	Source
Dependent Variable			
SR	6 - 19	AAA=19, AA+=18, and so on to B+=6	Standard & Poor's CreditWeek
Nonfinancial Variables			
SF	(0,1)	Sinking fund issue.	Moody's Bond Survey
MTGE	(0,1)	First mortgage bond.	" "
NUKE1	(0,1)	Involvement with nuclear plant.	Standard & Poor's CreditWeek
NUKE2	(0,1)	Trouble with nuclear plant.	" "
REG1	(0,1)	Cooperation of regulatory bodies necessary for continued satisfactory performance.	
REG2	(0,1)	Regulatory cooperation necessary for continued viability.	" "
YR1	(0,1)	Offering date 2/23/81-2/28/82	Moody's Bond Survey
YR2	(0,1)	Offering date 3/01/82-2/28/83	" "
YR3	(0,1)	Offering date 3/01/83-2/29/84	" "
IND1	(0,1)	Electric utility	Moody's Public Utility Manual
IND2	(0,1)	Natural gas producers and distributors	" "
IND3	(0,1)	Telecommunications	" "
Financial Variables			
CONST	percent	Cash flow to construction expenditure	Standard & Poor's Credit Week
RCONST	percent	CONST - median value of industry index for the year.	-
PROP	percent	Property funding ratio.	Moody's Bond Survey
RPROP	percent*	PROP/median value of industry index for the year.	-
DE	percent	Pro-forma long-term debt to total capitalization.	Annual Reports
RDE	percent*	DE/median value of industry index for the year.	
SIZE	$millions	Permanent capitalization.	
RSIZE	percent*	SIZE/median value of industry index for the year.	
ROE	times	Coefficient of variation of return on equity over 5 years.	
RROE	percent*	ROE/median value of industry index for the year.	
COV	times	Pretax interest coverage.	
RCOV	percent*	COV/median value of industry index for the year.	

Table 2 -- continued

Variable Definitions

Variable	Dimension	Composition	Source
Pension Variables			
FR	percent	Plan assets to accumulated benefits - reported benefits.	FASB 36 data tapes - 10K reports
RFR	percent	FR/median value of industry index for the year.	
SUNB	percent	(Plan assets - reported benefits)/ SIZE	
RSUNB	percent	UNB - median value of industry index for the year.	
PUNB	percent	(Plan assets - reported benefits)/ pension expense	
RPUNB	percent	PUNB - median value of industry index for the year.	
EFR	percent	Plan assets to economic benefits	
REFR	percent	EFR/median value of industry index for the year.	
EUNB	percent	(Plan assets - economic benefits)/ SIZE	
REUNB	percent	EUNB - median value of industry index for the year.	
PEUNB	percent	(Plan assets - economic benefits)/ pension expense	
RPEUNB	percent	PEUNB - median value of industry index for the year.	
TFR	percent	Plan assets to termination benefits	
RTFR	percent	TFR/median value of industry index for the year.	
TUNB	percent	(Plan assets - termination benefits)/ SIZE	
RTUNB	percent	TUNB - median value of industry index for the year.	
PTUNB	percent	(Plan assets - termination benefits)/ pension expense	
RPTUNB	percent	PTUNB - median value of industry index for the year.	

Table 3

Descriptive Statistics

N=282

Variable	Mean	Standard Deviation	Minimum	Maximum	Number Coded 1	Percent in Sample
Dependent Variable						
SR	13.0886	2.6737	6.00	19.00		
Nonfinancial Variables						
SF					125	44.33
MTGE					224	79.43
NUKE1					177	62.77
NUKE2					61	21.63
REG1					155	54.96
REG2					8	2.84
YR1					107	37.94
YR2					106	37.59
YR3					69	24.46
IND1					209	74.11
IND2					45	15.96
IND3					28	9.93
Financial Variables						
CONST	45.3128	39.4291	-96	208.2581		
RCONST	-10.3828	29.4754	-138.600	105.3271		
PROP	43.6503	7.0726	19.8	72.1		
RPROP	.9777	.1641	.4573	1.6312		
DE	48.7011	6.5897	20	67		
RDE	1.0117	.1367	.4667	1.5053		
SIZE	3327.6362	3006.96	95.528	16584		
RSIZE	.8281	.9466	.0271	5.9588		
ROE	.1237	.0756	.0133	.5699		
RROE	1.3910	.8953	.1118	5.5871		
COV	2.8176	.8538	1.45	6.10		
RCOV	.9854	.2743	.3796	1.8560		

Table 3 -- continued

Variable	Mean	Standard Deviation	Minimum	Maximum	
Pension Variables					
FR	1.1966	.3536	.6016	2.6446	Reported benefits
RFR	1.0437	.3242	.5569	2.3479	
SUNB	.0091	.0189	-.0404	.0904	
RSUNB	.0009	.0154	-.0457	.0483	
PUNB	1.4578	2.9186	-5.6709	15.7534	
RPUNB	.2569	2.9313	-7.0298	14.3945	
EFR	.7980	.2451	.4015	1.8764	Economic benefits
REFR	1.0515	.3374	.5568	2.5774	
EUNB	-.0230	.0278	-.1343	.0363	
REUNB	.0001	.0303	-.1400	.0621	
PEUNB	-3.2395	3.0876	-13.3178	5.3379	
RPEUNB	.3227	3.1359	-8.7602	9.8956	
TFR	4.2014	1.8053	1.4044	12.6491	Termination benefits
RTFR	1.0933	.4165	.4374	3.1744	
TUNB	.0559	.0464	.0047	.2577	
RTUNB	.0032	.0392	-.0078	.1750	
PTUNB	8.0271	4.1795	1.3353	41.3572	
RPTUNB	.4341	4.1089	-6.4103	34.9474	

Table 4

Correlation Among Pension Variables

Pearson correlation coefficients -
* = coefficient significant at <.001 level

	RFR	RSUNB	RPUNB	REFR	REUNB	RPEUNB	RTFR	RTUNB	RPTUNB
'R	1.0000*	.74991*	.83537*	.92238*	.72532*	.85579*	.76205*	-.11395	.33591*
;UNB	.74991*	1.0000*	.76551*	.73951*	.49763*	.67735*	.65082*	.34708*	.47252*
'UNB	.83537*	.76551*	1.0000*	.74220*	.58478*	.73827*	.57360*	.04705	.68338*
:FR	.92238*	.73951*	.74220*	1.0000*	.70951*	.87300*	.95018*	-.00381	.36444*
:UNB	.72532*	.49763*	.58478*	.70951*	1.0000*	.73280*	.61601*	-.51718*	.22095*
'EUNB	.85579*	.67735*	.73827*	.87300*	.73280*	1.0000*	.78173*	-.13624	.19746*
:FR	.76205*	.65082*	.57360*	.95018*	.61601*	.78173*	1.0000*	.09691	.32716*
:UNB	-.11395	.34708*	.04705	-.00381	-.51718*	-.13624	.09691	1.0000*	.32492*
'TUNB	.33591*	.47252*	.68338*	.36444*	.22095*	.19746*	.32716*	.32492*	1.0000*

Association Between Financial and Pension Variables

Regression of Each Pension Variable on Financial Variables:

RCONST, RPROP, RDE, RSIZE, RROE, RCOV

Pension Variable	Adjusted R-square
RFR	.0962
RSUNB	-.0108
RPUNB	.0757
REFR	.0592
REUNB	.1459
RPEUNB	.0548
RTFR	.0217
RTUNB	.1781
RPTUNB	.0381

Table 5

Regression Results
N=282, Dependent variable - SR

Variable	Predicted sign	Reduced Model Control Model Coefficient	T Stat.	Prob.	Full Model Reported Benefits Coefficient	T Stat.	Prob.	Full Model Economic Benefits Coefficient	T Stat.	Prob.	Full Model Termination Benefits Coefficient	T Stat.	Prob.
Intercept		12.533	10.784	<.001	12.404	9.790	<.001	10.536	7.536	<.001	11.347	9.362	<.001
SF	-	-.851	-4.401	<.001	-.790	-4.014	<.001	-.700	-3.674	<.001	-.734	-3.766	<.001
MTGE	+	1.499	4.607	<.001	1.573	4.788	<.001	1.567	4.946	<.001	1.500	4.677	<.001
NUKE1	-	-.369	-1.295	.196	-.429	-1.451	.148	-.438	-1.524	.129	-.380	-1.280	.202
NUKE2	-	-1.221	-4.769	<.001	-1.213	-4.663	<.001	-1.214	-4.793	<.001	-1.216	-4.726	<.001
REG1	-	-.291	-1.140	.255	-.266	-1.039	.299	-.299	-1.203	.230	-.250	-.987	.325
REG2	-	-1.180	-2.049	.041	-1.189	-2.061	.040	-1.159	-2.063	.040	-1.198	-2.101	.037
RCONST	+	.015	3.524	.001	.016	3.681	<.001	.010	2.524	.012	.014	3.332	.001
RPROP	-	-2.144	-2.779	.006	-1.968	-2.520	.012	-1.461	-1.912	.057	-1.474	-1.880	.061
RDE	-	-2.255	-2.524	.012	-2.318	-2.493	.013	-2.215	-2.485	.014	-2.096	-2.297	.022
RSIZE	+	.703	6.433	<.001	.680	5.964	<.001	.647	5.981	<.001	.608	5.411	<.001
RROE	-	-.370	-3.449	<.001	-.393	-3.593	<.001	-.398	-3.771	<.001	-.428	-3.986	<.001
RCOV	+	4.971	11.182	<.001	4.908	10.924	<.001	5.126	11.608	<.001	5.080	11.373	<.001
RFR	+				.075	.126	.899						
RSUNB	+				17.230	1.596	.112						
RPUNB	+				-.068	-1.054	.293						
REFR	+							1.026	1.749	.081			
REUNB	+							-21.588	-4.425	<.001			
RPEUNB	+							.067	1.034	.302			
RTFR	+										.311	1.240	.216
RTUNB	+										8.565	2.936	.004
RPTUNB	+										-.063	-2.418	.016
Adjusted R-Square			.6646			.6650			.6852			.6753	
F Statistic*						1.09			6.86			3.95	

* The F statistics are from general linear tests of differential explanatory power of the full models over the reduced model (without pension variables). F* at a significance level of 5% is approximately 2.65 for (3,266) d.f..